G. R. S. 58]

Previous references.

Sanj File No. 139—14

1915.

Serial Nos. 1—6

(Sanitary)

Later references.

San 133—158 1-4 B. April 1916

GENERAL AND REVENUE SECRETARIAT.

Serial Nos. 1—6

Part B for Jan 1915

SUBJECT.

Preparation of Pamphlets on Hygiene by Dr. M. Sreenivasa Rao—

To the D. G. of Education in Mysore
No. 135 - 87. 9. 7. 15.

Issues certain instructions for the printing of the Pamphlets on Hygiene by Dr. M. Sreenivasa Rao in Consultation with him—

GPB—10,000—23-3-15

M. Rao 6/4/15

G. R. S. [11]

1914-15

GENERAL AND REVENUE SECRETARIAT.

(Sanitary)

NOTES.

File No. 139-14

FILE HEADING.

Elementary health and sanitary rules for the public

From

No.	Dated	Received

Diary No.	Enclos.	Spare Copies.	Serial No.

BRIEF ABSTRACT OF LETTER.

NOTES AND ORDERS.

NOTES—First Sheet.

GPB—20,100-2-8 8-14

No 9. 136.
3.2.15.

2

GPB—1,000—10-1-14

GEN. AND REV. SECRETARIAT.

TO THE DEWAN OF MYSORE
FOR ORDERS.

—o—

SUBJECT: ORG. & DEV. SUBJECT No.3/E&M.

Re - Elementary health and Sanitary rules for the public.

---

* Two pamphlets received from Dr. Srinivasa Rao, are put up herewith.

2. Messrs. P.S.Achyuta Rao and M. Shama Rao were also consulted in regard to the pamphlets which they consider to be generally suitable. In accordance with the suggestions made by Mr. Shama Rao, Dr. Srinivasa Rao has proposed certain additions for incorporation in their proper places.

3. If approved, the pamphlets will be caused to be set in type and - - 'proofs' will be submitted for final approval.

D. M. Narayana Rao
3/2

Dewan)

* (i) A short one (about 6 pages of printed matter demi-octavo).

(ii) A larger one (about 35 to 40 pages of printed matter).

5458
13-2-15

I agree.
If there be no objection the proofs may be sent to Mr. Foulkes for any additions, omissions or alterations he may wish to suggest.

13.2.15.

G. R. S. 12]

General and Revenue Secretariat. | File No. 139 of 1914-15

Serial No.	
	Supdt Bor IV
Supdt 2 Mr Ardagh: Supdt 6 to be personally responsible as regards date etc Hm	5 Please put up draft to Supdt G.P. Branch three 2 pamphlets & requesting him to send final proofs to Dr. Srinivasa Rao by the 15th March together with the originals. Two spare copies after proofs may also be sent to this office for information.
	6 5 ~~proof~~ copies as finally passed by Dr. Srinivasa Rao shall be sent to this office by the Supdt before 31-3-15 Send Copy after letter to Dr. S Rao. Hm 15/2
Send book like in Small size (like handbook of Ec: Coops, village industries etc) Price pamphlet like other pamphlets	) Draft to Supdt Govt. Press Babu BC 15/2 Verney Todhunter Hm 15/2
	8 I. E. Superintendent, Govt press Dr 6303 18-2-15 Forwards manuscripts of two pamphlets on "Agriculture" & requests that final proofs thereof may be sent to Dr. M. Srinivasa Rao.
	9 Two Copies of proofs are herewith submitted as desired.
	10 Draft to col Todhunter is submitted for approval. 27-2-15 BC Hm 2/3

NOTE—Contn. sheet.

See 4) under Secy's Signature

Price 2/3/15

C. R. S. 12]

General and Revenue Secretariat.

Gen— File No. 139 of 1914-15

Serial No.	
2	11 To, Lt-Col. J. H. Forbes, I.M.S, Durban physician & Surgeon, No 6801 dated 3.3.15. Forwards proof Copies of the manual of hygiene prepared by Dr. M. Srinivasa Rao and requests him to favour him with his suggestions.
3	12 From the same officer, D.O dated 5.3.15 Returns the proofs with the intimation that he Cannot go through them as he has to leave the station immediately
	13 Submitted with reference to Dewan's orders contained in paragraph 4 of the office note.
	14 Please get the final proofs from the Press as soon as they are ready, or reader. 8.3.15 9/3
	The proofs are herewith submitted duly revised.
	15 It may perhaps be necessary to get them finally passed by Dr Srinivasa Rao before giving "Sterke" order. 20.3.15
	Submitted with reference to para 3 Supra (see 4) 22/3
	Please consult Dr S Rao and move 22/3
	16. Dr Srinivasa Rao has already gone through the proofs & approved them. It remains to print them after perusal by the Extraordinary Member of Dewan. The translation of the pamphlets & booklets into Kannada may be left to the D.G. of Education

NOTE—Contn. sheet.

GPB—25,000—2-11-14

G. R. S. 12]

General and Revenue Secretariat.

5559 / 6386 (5)

File No. 139 of 1914-15

Serial No.

ueed the Malicad Improvement Committees :-

Strawdria member of Council

D. M. Narasinga Rao 22/3 Hon 22/3

17 Seen. I do not know of the Sanitary Commissioner has seen these manuals of which he has any suggestions of his own to offer.

D.S. (Mr. Ramachandra Rao) 23.3.15

18 Please consult S.C. & d.o.

Diary 30/3

If above copies of forms are in the Box please score off the words 'returns with'

From D.O. put up Hon 30/3

4 1915 To the Sanitary Commissioner, No. 7559 dated 30.3.15

Forwards for information and favour of suggestions & remarks a spare copy of each of the two pamphlets on Hygiene prepared by Dr. M. Srinivasa Rao.

3 20 5 From the Sanitary Commissioner, D.O. dated 12.4.15

Forwards copy of book "Health reader for Indian High schools" and commends it for use as a text book in High Schools in preference to the Manual of Hygiene prepared by Dr. Srinivasa Rao

Submitted for orders

16.4.15 Hon 16/4

NOTE—Contn. sheet.

GPB—60,000—[illegible]

Development Dept. Subject. 6388 6

G. R. S. 12]

General and Revenue Secretariat. | Gen File No. 139 of 1914-15

Serial No.

21 Resubmitted with reference to para 17. If Easier publications prove necessary, it will not be difficult to produce them. Much time & trouble have been spent on the two compilations by Dr Srinivasa Rao. The Kannada rendering may be made less technical & more simple in due course

Dewan 24.4.15

(Awaiting speaker)

22 I agree much time and labour have been spent by Dr. Srinivasa Rao on his two Compilations and I have no objection to his two pamphlets on Hygiene being printed and translated.

Proposal for Dewan's orders

Dewan 24.4.

23 There are several good treatises on Hygiene now available for the use of schools. Col. T.H. Foulkes had highly recommended the book "Life, Light and Cleanliness", sent yesterday; and the Health Reader now recommended by the Senior Surgeon appears also a suitable one for the use of Indian schools, as it is both illustrated and written in a simple language

24 The principal factor for consideration in the selection of a suitable book is whether it will prove useful to the class of readers to whom the publication is intended. As the book is primarily intended for the use of schools and also for general readers, it is best, I think, if the selection is left in the hands of the Inspector-General of Education.

To be made in consultation with the Sanity Commissioner.

NOTE—Contn. sheet.

6927 27.4.15 Dewan (with 2 books referred to in para 23) see

GPB—25,000—22-3-15 Dewan 28/4

Dewan 24.4.15

Serial No.

25 I do not know ~~of~~ with what particular object these pamphlets have been got up. I ~~have~~ have glanced through the contents and find that they are fairly up to the ~~average~~ average of such publications. But why should these books be issued with the imprimatur of Govt? The matter is such as will be judged according to its merits (manner of presentation & accuracy originality and usefulness of its facts and theories). ~~and~~ There are we must recognise, certain things which the Government cannot either make or mar by its taking them under its wings.

26 I have seen both better & worse publications on the subject than Dr Sr Ram's pamphlets. The best way to deal with them (Cost & waste Dr Sr Ram's time & trouble)

7

will be to ask him to publish them on his own authority (either ~~or~~ as a private publication or as Govt Report: mental aid). They may be sold at a nominal price.

27 I think the pushing forward of books to be meant for enlightenment the public may be left to the Edn department or to Ed Committee.

27/5/15

Draft subd

31/5

Secy

28 A tidy draft as slightly revised maybe duly put up.

1/6

Director Surg. Physical

7685
4.6.15

29 A tidy draft is submitted which may be approved

1/6. Secy
Director

1/6

Director Surg Physical 2/6

30 Approved. Please show to the Sanitary Member after issue

7-7-15.

7/7
7-7

Ma
7/7

G. R. S. 12]

6386

9

General and Revenue Secretariat.

Gen File No. 139 of 1914-15

Serial No.	
6	31 To The Inspr General of Education in Mysore — No 135 dated 9.7.1915 — States that the two pamphlets on Physical Exercises by Dr M. Srinivasa Rao on Hygiene may be printed on the authority of the author as a departmental publication and sold at a Nominal price, and Suggests that they may be printed at the Govt Press, where the whole matter is now standing in type and the sale proceeds thereof credited to Govt in due course —
	To Dr Srinivasa Rao, No 136 dated 9.7.1915. Forwards copy of the above for information —
	39 Submitted for kind perusal —
	12/7/15. Extraordinary Member
	33 Seen. 5.8.15
	6/8

NOTE—Contn. sheet.

GPE—25,000—22-3-15

10

THE PUBLIC HEALTH INSTITUTE,

BANGALORE, 25/11/1915.

Dear Mr Ramanathan

Thank you for your D.O. of 23rd instant & its enclosure. In the accompanying manuscript, you will find a few notes on the points brought forward by Dr Ghosh.

The typed copy of the larger pamphlet is not the one that I corrected on a former occasion. Some additions & alterations which I had noted on the margin are not to be found in the copy now sent. Perhaps you have it with you.

Page 56. (To come after the words "bathing in the open air")

The nails, more particularly of the fingers, should be periodically pared and kept clean. They should not be allowed to grow too long as they afford spaces for the collection of dirt. Many boys and even a few adults get into the bad habit of biting the nails. This is a dangerous practice not to say anything about its being disgusting: many cases of Whitlow are caused by the infection of any small scratch or wound near the nails, with the microbes found in the saliva.

Page 48 (To come after the words "moderation as regards quantity")

The practice of allowing children to partake of food which has been partly eaten by their elders, should be discouraged. Certain people consider it a sign of good friendship if they eat out of the same plate. Recent discoveries show that many apparently healthy people harbour in their bodies dangerous diseases such as cholera, typhoid fever, consumption &c and if such people are allowed to infect the food which is being

eaten by others, the danger of the spread of disease to healthy people is evident. Therefore each person irrespective of age and relationship should be provided with a plate or clean leaf and have meals served separately. Metal plates, especially those of aluminium being comparatively cheap, should be used in preference to leaves. Fresh plantain leaves, well washed with clean water are no doubt good but everybody cannot afford them for daily use. Dry stitched leaves should be avoided wherever possible. Aluminium plates with come cheaper in the end as they can be cleaned every time they are used.

Sep 62 (to come after "Hours of study should not be too long")

Wherever possible, the light for reading should come from one's left or from behind. Very strong light should not be used for reading purposes. Diffuse day-light is the best. If electric light is available it can be used for reading at night. Otherwise a good lamp ~~be~~ burning refined Kerosene will do. Cheap and badly refined Petroleum oils should not be used, as during burning they give off many gases, the breathing of which, especially in an

ill-ventilated room, produces deleterious effects on the body. Books printed in very small type should be avoided as the eyesight is spoiled thereby. The increase of short-sight among school-going population is directly due to the excessive reading of badly printed books, in insufficient lights. Reading in Railway trains or in vehicles in motion is not conducive to the preservation of good sight.

15

D. O. 877

OFFICE OF THE INSPECTOR GENERAL OF EDUCATION IN MYSORE.

Bangalore, 21st January 1915

My dear Mr. Ramanathan,

Your D.O. dated the 9th instant. I send herewith a few notes on Dr. Srinivasa Rao's pamphlets on Sanitation and Hygiene, kindly sent to me for perusal. I return herewith the pamphlets.

Yours sincerely,

M. Shama Rao

N O T E S

o n

DR. SRINIVASA RAO'S PAMPHLETS ON SANITATION AND HYGIENE.

-:o:-

Both the booklets are excellently written. As the bigger one assumes in the reader some acquaintance with the elements of physiology, physics and chemistry, it will afford profitable reading chiefly to pupils of Colleges and the intelligent among the pupils of the Sixth Form of the High Schools. School-children below that standard will find it a little too high. The smaller one is, however, quite within the comprehension of pupils of the III and the IV Forms. Both the pamphlets will be found highly useful to the general public, and the bigger will appeal to those that possess some general culture. In as much as they contain information that would come in handy in every household, they may be translated into Kanarese.

An observation or two may, however, be made here as regards their contents.

1. When so much has been said on the uses of water and air, a word or two on the uses of light may not be out of place especially if the books are intended for the benefit of pupils also. That myopic children are on the increase in our schools is well known. Would it not be useful then to point out to

school

School children particularly, that light should fall from the left or the back while reading, writing or even eating, that reading in the twilight should be avoided?

2. Since Hindus are in the habit of eating with their hands, a word may be said about keeping the nails clean. The bad habits of biting the nails and eating of what has been partly eaten by others especially if they happen to be consumptive or in other ways sickly should be discouraged.

3. A few technical words like Erysipelas, Bacilli etc., may be explained by means of foot-notes.

4. A reference is made under marriage to the practice of Mussulmans of carrying away by force, unmarried Hindu girls. This may be modified by omitting the word "Mussulmans" and putting in some other general word.

"Anandalaya"
Chamrajpet.
Bangalore
12th January 1914

Dear Sir

I have carefully read through the two pamphlets on Sanitation & Hygeine forwarded with your letter of the 9th instant.

I am of opinion that the smaller pamphlet should answer the purpose of enlightening the masses.

The bigger pamphlet partakes more of the nature of a handbook for the benefit of higher class

(20)

10.3.15

ELEMENTARY MANUAL OF HYGIENE

BY

DR. M. SRINIVASA RAU, M.A., M.D.,
B.Sc. (EDIN.) D.P.H. (CANTAB.) AND F.C.S. (LONDON)
Director of Public Health Institute and Deputy Sanitary Commissioner in Mysore

BANGALORE:
PRINTED AT THE GOVERNMENT PRESS
1915

ELEMENTARY MANUAL OF HYGIENE.

HEALTH may be defined as the state of being well. It is impossible to overrate the blessings of health. It is only when we lose it that we can realise the value of what we have lost. Disease literally means "deprivation of ease" which is due to the derangement of the physiological functions of one or more organs. When we become aware, in many cases painfully aware, of the existence of any organ, we may be practically certain that something is wrong with it. By finding the cause and applying the remedy, a "cure" is brought about. The "cure" simply means the restoration of the organ or organs to their original condition, enabling them to perform their proper functions.

The human body is comparable to a steam engine inasmuch as both consist of many parts and

joints which require constant care and attention. The steam engine requires fuel, water and air for any work to be got out of it. Similarly, the human body requires food, water and air to enable it to do any useful work. The gaseous air is the most important constituent for the sustenance of life, the liquid water and solid food coming next in the order of importance.

AIR.

The atmospheric air is a mixture of 21 parts of oxygen, 78 of nitrogen, 0·9 of argon and 0·1 of other gases in minute quantities. Respiration not only abstracts oxygen from the air but adds to it carbonic acid gas, watery vapour, organic matter and a little ammonia. It is the object of ventilation to allow the access of fresh air from outside, to remove the vitiated air in inhabited rooms and render them habitable. Therefore, natural ventilation should always be allowed by keeping at least one window in each room open both day and night. If ventilation is necessary for healthy men, it is all the more so for sick persons Persons suffering from consumption, pneumonia, etc., should be kept always in the open air. Constantly breathing impure air in confined rooms brings about stunted growth, sickly

condition of the body predisposing it to various diseases and feebleness of mind. Babies and growing children should be out in the open air as much as possible.

WATER.

All living objects require water for the maintenance and sustenance of life; more than two thirds of the weight of the human body is made up of water. It dissolves food and carries it to the tissues, assists the removal of waste products renders nutrition and chemical changes possible and regulates the temperature of the body by means of evaporation.

In nature, water is hardly ever found in an absolutely pure state. Rain water collected in a clean glass vessel, approaches nearest to it. Water passing underground or flowing overground takes up many soluble substances such as common salt and in some cases holds in suspension insoluble materials such as mud. The suspended material tends in course of time to settle down leaving the fluid fairly clear. More dangerous than substances held in solution or suspension are minute living germs which gain access to the water by people washing their clothes or dirty vessels or bodies

therein. Allowing cattle free access to the source of water-supply, also tends to pollute the water. Thus in ordinary palatable waters, may lurk deadly germs of cholera, typhoid fever and dysentery and eggs of round worms, thread worms, etc. It is consequently of the greatest importance to protect water supplies. The rural areas where wells form the chief or perhaps the sole source of a supply of drinking water, one or more wells must be provided with pumps. This would prevent the people from letting dirty vessels or even dirty cloths into these wells. Step-wells are less satisfactory than draw-wells. Sinking a step well should be discouraged as much as possible. Straining the water through a piece of cloth in no way purifies it, but it is of use where guinea worm is common. The piece of cloth keeps back the small insect cyclops in the body of which the eggs of guinea worm undergo development, prior to introduction into the human body. Where there is any suspicion as to the purity of the water, the safest course would be to boil it and cool it before drinking it.

FOOD.

Food is necessary for the building up of the

body and to repair the waste, that is constantly going on in it. The homely proverb "Eat to live and not live to eat" should never be forgotten. All food substances can be grouped into four classes.

(1) Nitrogenous materials or Proteids.

(2) Fats.

(3) Sugar and starches.

(4) Salts both organic and inorganic.

Animal proteids, *e.g.*, meat, fish, etc., are more easily digested than vegetable proteids, *e g.*, peas, beans, pulses, etc. The same is true of fats, ghee being more digestible than vegetable oils. For a man to keep good health and do a moderate amount of physical and mental work, the daily dietary should consist of about $4\frac{1}{2}$ ounces of proteids, 18 ounces of sugar and starches and $1\frac{1}{4}$ ounces of fats. For hard work, sugar and starches should be greatly increased. For one at rest, the proteids should be greatly reduced. Condiments, *e.g.*, chilies, tamarind, etc., should be used in great moderation as they irritate the digestive organs when taken in large quantities. Tea and coffee are good stimulants when not infused too long and not taken too often or in too large quantities. A single cup of either, ought to be enough for all purposes.

All alcoholic liquors both fermented and distilled ought to be altogether avoided. Diseases of stomach, liver, kidney and nerves are very common in excessive drinkers. The cereals and pulses should be well cooked before being eaten. Cooked food should not be kept uneaten for a long time, as it is liable to contamination in various ways and to putrifaction. Flies should be prevented as much as possible from sitting upon any eatables. They act as mechanical carriers of infection by settling first upon excreta and then on food stuffs. Cholera, dysentery, diarrhea, typhoid and allied fevers are thus propagated by the agency of flies.

PERSONAL HYGIENE.

The most important factor is eating and drinking. The food eaten should be good, wholesome and well-cooked. For adults, two meals a day taken at regular hours, are enough. Food should never be taken in excess, even during feasts. All young people should be taught to chew the food carefully and eat slowly. Hands and feet should be well washed before and after taking meals. The mouth should be well rinsed with clean water and all particles of food sticking between the teeth should be

carefully removed as otherwise putrifaction will set in causing the decay of the teeth. Too much water should not be taken during meals. All alcoholic liquors and intoxicating drugs, *e. g.*, opium ganja, tobacco, cocaine should be religiously avoided. Indiscriminate spitting is both filthy and dangerous. If spitting is unavoidable, a spittoon should be used, the contents being often burnt or buried and the vessel itself cleaned frequently. The bedding should be clean and free from insects, *e.g.*, bugs, fleas, etc. When sleeping, the body should be covered up warmly but the face should be left uncovered so as not to impede free breathing. Bed-room windows should be kept wide open to secure free ventilation. The whole body should be washed not less than once a day with soap and warm water. An oil bath may be taken once or twice a week. Wet clothes should not be allowed to cling to the body for any length of time, especially when one is bathing in the open air. Good and sufficient exercise should be taken, stopping short of fatigue. As much time as possible should be spent in the open air. Breath should always be taken and given out through the nose and never through the mouth. Children should be taught to breathe through the nose both when awake and asleep. It is good to practice deep breathing exercises every morning and evening for not

more than ten minutes at a time. A cheerful and contented frame of mind should be cultivated avoiding all worry. Marriage should be delayed till the body is fully grown, that is, till about 24 in the case of a man and 18 in the case of a woman. Early marriage prevents the proper development of both husband and wife. The offspring of young couples has less vitality and less power of resistance to disease than children of grown-up parents. A child should be weaned from the mother's breast, when it cuts its first tooth, that is, when it is about 7 to 8 months old. The pernicious custom of giving the breast for two to three years or even more should be discouraged. Persons suffering from tuberculosis, leprosy, syphilis, insanity, etc, should be prevented from marrying and propagating their species or their diseases.

HOUSES.

Houses should not be built in a damp place but in a high and dry locality. Every house should have a basement and be above the level of the street and the drains therein. Every room in the house should be provided with large windows to allow plenty of air and light. The flooring should be of stone or of

some hard material into which rats cannot burrow. The ideal to aim at, is to have no two houses contiguous to each other. All parts of the house especially the kitchen and the bed-rooms must be kept scrupulously clean and white-washed every year. White-washing is really a method of chemical disinfection for the walls and roofing. No sewage should be allowed to accumulate or soak into the ground in or outside the house. It should be let into public drains where they exist. If not, the sewage should be collected in a cess-pit not more than 4 feet deep and removed every day or utilised for the garden in the backyard. The house must be provided with a latrine and conserved daily. Where this is not possible a shallow pit as far away from the well and the living quarters as possible, may be used but the excreta must be covered every day with a layer of earth or of ashes. The pit must be periodically emptied and the contents removed to fields. Large quantities of grain should not be stored in the house as they attract rats and other vermin. Cattle should not be kept within the dwelling house but an adjacent structure must be provided for them. Manure should not be stored in or near the house but should be carried to places specially appointed for the purpose.

DISINFECTION.

In fighting any disease, the following agents should be freely made use of, sunlight, open-air, heat and boiling water. If a case of plague occurs in a house, all flea-infected articles such as clothing should be exposed to bright sunlight. All fleas are thus killed in a few minutes. Grain to which rats have had access, can be rendered safe by exposure to sunlight. Fleas and other insects can be got rid of from houses, by spreading dry straw, cowdung cakes, etc., on the floor and setting fire to them. Excreta of cholera and typhoid patients and sputum of consumptives can be rendered harmless by being burnt. Most of the infected articles of clothing can be disinfected by immersing them in boiling water for five minutes and drying them in sunlight. When a case of small-pox occurs in a house all unvaccinated children should be vaccinated at once. Not only is no danger incurred by taking this course, but a great deal of good is done to the unprotected children as vaccination will modify the virulence of small-pox, if they happen to be incubating small-pox germs in their bodies.

Compared with previous proof
MJL
12/2/15

21

Lauer. Brd
10. 3. 1.

MANUAL OF HYGIENE

BY

DR. M. SRINIVASA RAU, M.A., M.D.,

B.Sc. (EDIN.) D.P.H. (CANTAB.) AND F.C.S. (LONDON)

Director of Public Health Institute and Deputy Sanitary Commissioner in Mysore

BANGALORE:

PRINTED AT THE GOVERNMENT PRESS

1915

MANUAL OF HYGIENE.

Health may be defined as the state of being well. The body is made up of a number of organs each of which has its own particular physiological function to perform. If all the functions are done in such a way that none of them obtrudes itself prominently into our consciousness we may be said to be well for all practical purposes. It is impossible to overrate the blessings of health. It is only when we lose it that we can realise the value of what we have lost. People living in a state of nature may have to struggle hard for their very existence but that very struggle tends in majority of cases to preserve their bodies in a perfect state of health. It is by no means meant that we should all go back to a state of nature even if that were possible. We are all borne on the tidal have of civilisation and whether we like it or not, we have to conform ourselves to our surroundings. Living under an artificial state of things, we have to refrain from actions which we may naturally like to do and perform those which we may naturally dislike to do. An individual leading a solitary life in an uninhabited island may do many things which he dare not do in a village or a town where he has to come into contact with his fellow human beings. Individual liberty must be sacrificed to some extent for the good of the community. This is required to a greater extent in the interests of public health than in almost any other concerns of life. As a result of experience of centuries, certain rules have been formulated which every member of a community has to obey if a communal life is to be rendered at all possible. Any deviation, intentional or unintentional, from these rules is bound to result in a state of disease.

Disease literally means "deprivation of ease" which is due to the derangement of the physiological functions of one or more organs. When we become aware, in many

cases painfully aware, of the existence of any organ, we may be practically certain that something is wrong with it. If we are wise, we at once set about looking for the cause of the disease. If we are fortunate enough in finding it, we may apply a suitable remedy and cure the disease. The "cure" simply means the restoration of the organ or organs to their original condition enabling them to perform their proper functions. Many of us are unfortunately not wise and instead of setting about to discover the cause of the disease, try to get rid of the painful symptoms, leaving the cause at work and making matters worse. Then relief is sought at the hands of those who profess to have made a special study of human disease. Some of these professors confine themselves to setting right the observed derangements while others take a wider outlook and try to get at the root of the causes which bring about these derangements. Thus have arisen the two great branches of the profession of medicine, the curative and preventive.

The aim of preventive medicine is the preservation of public health by bringing about favourable conditions of life and removing all unfavourable ones. Public health is the basis of the economic prosperity of a country. Without it, a nation can never become pre-eminent either physically or morally or intellectually. Where public health is at a discount, the people can never put forth their best efforts and their earning capacity is greatly reduced. The money spent upon maintaining public health at a high level of efficiency will indirectly repay itself sooner or later.

The human body is comparable to a steam engine inasmuch as both consist of many parts and joints which require constant care and attention. The steam engine requires fuel, water and air for any work to be got out of it. Similarly, the human body requires food, water and air to enable it to do any useful work. The analogy should not, however, be pushed too far. It must not be forgotten that a human being not only works, but thinks and reasons and that the body grows from infancy to adult age. Food, water and air may be taken to represent solid, liquid and gaseous material which the body needs for its growth and maintenance. If solid food is withheld, the body will continue to live for some considerable time. A much less period is enough to deprive the body of its vitality if water is not supplied to it and a still less period, to be counted

by minutes, suffices for the destruction of life if the supply of air is cut off. Thus, the gaseous air is the most important constituent for the sustenance of life, the liquid water and solid food coming next in the relative order of importance.

Air.—The atmospheric air is a mixture of 21 parts of oxygen, 78 of nitrogen, 0·9 of argon and 0·1 of other gases in minute quantities. It also contains a varying proportion of watery vapour, dust and gaseous impurities of local origin, such as, carbonic acid gas. The most important constituent of air is oxygen, without which no combustion can ever occur. In a pure condition, it cannot be breathed as it burns up the body rapidly. It is safe in the atmospheric air as it is mixed with about 4 times its volume of nitrogen, which is an inert gas and thus moderates the activity of oxygen. In a confined room to which there is no access of fresh air, the quantity of oxygen will undergo progressive diminution, if the atmosphere is being breathed by men or other animals. A lighted candle covered by a bell-jar will burn only as long as there is oxygen. When the oxygen is all used up it will go out. Similarly, the confined atmosphere of a room will sustain life only for a very short time, if no fresh current of air is let in to take the place of the oxygen used up in the process of breathing. Respiration not only abstracts oxygen from the air but adds to it carbonic acid gas, watery vapour, organic matter and a little ammonia. It is the organic matter that undergoes rapid putrifaction and imparts to the air of an ill-ventilated room a fœtid smell which is perceptible to one entering the room for the first time. It is the object of ventilation to allow the access of fresh air from outside, to remove the vitiated air in the room and to render the room habitable. Natural ventilation is dependent upon winds and upon local currents due to differences between internal and external temperatures. The air in an inhabited room is naturally warmer than the air outside. The heated air tends to rise and to take its place fresh air finds its way by doors and windows. Even when these latter are closed, they are never close-fitting and air from the outside will enter through cracks and crevices. In our country, it is never so cold as to necessitate the closing of windows. Natural ventilation should always be allowed by keeping at least one window in each room open both day and night. If ventilation is necessary for healthy men it is all the more so for sick persons.

Rooms used by patients should have all the windows open always. Many educated men are under the impression that the windows of a sick room should be kept shut. This is an altogether wrong idea and ought never to be encouraged. Persons suffering from some diseases, *e.g.*, consumption and pneumonia ought, if possible, to be kept in the open air. Disease germs are fewest in the open air and even those few cannot thrive. Fresh air and sunlight are two powerful agents in preventing disease and do not cost anything. Therefore, as much of these two beneficent agents as possible should be allowed to enter our dwellings. Constantly breathing impure air in confined rooms brings about stunted growth, sickly condition of the body predisposing it to various diseases and feebleness of mind. Babies and growing children should be out in the open air as much as possible. The carbonic acid gas that is being constantly produced in the process of burning of fuel and of breathing by men and animals, does not accumulate to an unlimited extent in the atmosphere. The innumerable green plants found all over the face of the earth, make use of the carbonic acid gas as their food material. During the day, with the aid of sunlight the green colouring matter of the plants breaks up the carbonic acid gas into carbon and oxygen. The former is kept in the body of the plants for their food and oxygen is given off to the atmosphere. Thus between the abstraction of oxygen by the animals and its liberation by the plants, the amount of oxygen in the atmospheric air is kept at a constant level.

Water.—All living objects require water for the maintenance and sustenance of life. The importance of water for food crops is of course well known and failure of timely rains means widespread distress. This distress becomes greatly accentuated when men and cattle cannot procure a sufficient supply of drinking water from the wells. More than two-thirds of the weight of the human body is made up of water. It dissolves food and carries it to the tissues, assists the removal of waste products, renders nutrition and chemical changes possible and regulates the temperature of the body by means of evaporation. It is being constantly passed out of the body in the form of watery vapour in the breath, as sweat both perceptible and imperceptible and in the excreta. To make up for this loss, a sufficient quantity of water must be supplied to the body. When too much water is abstracted from

the body as in the case of a cholera patient, the body becomes pinched and shrivelled up. Thus, a cholera patient must be given as much water as he can manage to drink. It is not only cruel but an act of folly to withhold water in such a case. Even babies which are fed on milk, nine-tenths of which consists of water, often cry, because they are thirsty. A little cold pure water relieves the thirst better than milk and also helps the baby's stomach and bowels to digest and absorb the food.

Water is a chemical compound of hydrogen and oxygen. In nature, it is hardly ever found in an absolutely pure state. To get it in this condition it will have to be distilled and perhaps double distilled. Even then, if it is kept for any length of time, it will absorb various things from the air. Fortunately, it is not at all necessary for any of us to drink distilled water. Rain water collected in a clean vessel approaches nearest to distilled water. In its passage through the atmosphere the rain water absorbs small quantities of various gases. When it reaches the earth, a portion of it sinks into the earth and the remainder collects into tanks or flows into streams and rivers. The water passing underground or flowing overground takes up many soluble substances *e.g.*, sodium chloride (common salt), etc., and in some cases holds in suspension insoluble materials, *e.g.*, mud. The suspended material tends in course of time to settle down leaving the supernatant fluid fairly clear. The matter held in solution depends upon the nature of the ground and the substances it contains. When wells are sunk the underground water may be tapped in some places and a fairly large quantity of water may continue to collect in the well. Such underground streams are fairly numerous and generally follow the lines of least resistance. Springs tapped in wells yield clear water having filtered through a thick layer of earth. Such waters may be palatable but only chemical analysis can reveal the nature and amount of the substances held in solution, and determine their potability or otherwise. Well water is less liable to pollution than water in tanks or rivers. More dangerous than substances held in solution or suspension are minute living germs which gain access to the water by people washing their clothes or dirty vessels or bodies therein. Allowing cattle free access to the sources of water-supply also tends to pollute the water. Thus in ordinary palatable waters may lurk deadly germs of cholera, typhoid fever and dysentery

and eggs of round worms and thread worms, etc. It is consequently of the greatest importance to protect water supplies. In rural areas where wells form the chief or perhaps the sole source of a supply of drinking water, one or more wells the waters of which have been pronounced to be potable by a competent analyst, must be provided with pumps. The mouth of the well may be closed by means of slabs leaving a man-hole with a properly fitting door which must be kept under lock and key. This would prevent the people from letting dirty vessels or even dirty clothes into these wells. Step-wells are less satisfactory than draw-wells. Sinking a step-well should be discouraged as much as possible. Step-wells are as liable to pollution as tanks and streams. Placing a watchman to see that a step-well or a tank is not polluted is pretty common. In all these cases, the watchman is of absolutely no use in preventing pollution. Before his very eyes people dip their feet in the water but the watchman does not consider it to be pollution at all, because he does the same thing himself when he has to fetch a pot of water. Some persons are in the habit of straining the well or tank water through a piece of cloth which is always dirty. This piece of cloth is washed in the well or tank and the water is then strained through it. The strained water is often more impure than the unstrained natural water of the well or tank. This straining may remove the larger particles which are suspended in water but it engenders a false sense of security and no further purification is considered to be necessary. There is, however, one disease which can be prevented by simple straining of water through a piece of cloth. In places where guinea-worm is common, the ova of the guinea-worm get into the bodies of a small insect called cyclops. The ova undergo development in the body of cyclops and when water containing these cyclops is taken into the human body, the insects are killed, the larvæ of the guinea-worm are set free and undergo further development in the human body producing their well-known results. Straining through a piece of clean cloth is useful and *sufficient* to keep back the cyclops and all danger of infection by the guinea-worm is thus avoided. But taking things as they are, it is always best to avoid straining the water. The safest course would be to boil the water when there is any suspicion about its purity. All the ordinary disease-producing germs are killed, and all danger of infection is thus

obviated. Many people have great faith in the efficacy of domestic filters in purifying water. The traditional 3-pot filter has had its day and very few people with any common sense will drink the water that has filtered through sand and charcoal in the middle pot. The water may be clear but there is no guarantee of its being germ-free. If the sand and charcoal are not frequently washed and renewed, the filtered water may contain more germs and be more dangerous than the original unfiltered water. The charcoal block filters are no better and they have fallen out of use now. The Berkfeld and Pasteur-Chamberland filters are better but even they require much attention to be bestowed upon them. If the filtering candles are frequently scrubbed with a brush and sterilised by being boiled in water, the filtered water will be good. But if the candles are left uncleaned for a long time the germs tend to grow through the pores of the candles and the filtered water may be worse than the unfiltered water. For large towns, supply of drinking water from wells is insufficient and often precarious especially in summer. For such towns, some means of public water-supply will become necessary. Water stored in large and deep tanks or from a running stream if close by, will have to be thought of. Tank water is liable to gross pollution by men and cattle. Streams also receive all sewage from villages and towns on their banks. In either case, the water requires preliminary purification before it can be supplied with safety to the people of a town. Storing the water for a sufficiently long time diminishes the amount of sediment and also the number of germs. Subsequent filtration either through sand filters or mechanical filters of the type of Jewell filters, will still further clarify and purify the water which may be distributed through stand pipes to all parts of the town. London is an excellent example of what can be done by storage and filtration of water. The Thames water receives the sewage of all the towns on its banks but yet when supplied to the Londoners is chemically and bacteriologically pure. In India, examples also are not wanting. Allahabad, Benares, and Lucknow and nearer home, Mysore City, Shimoga Town and Harihar are all supplied with river water properly purified by filtration. Bombay, Madras, Bangalore and Kolar Gold Fields all get their water-supply, from large tanks in which rain water is stored and then filtered. In the Mysore Province, the filters are all of the Jewell type

See copy.

and deliver excellent water from a bacteriological point of view.

Food.—Food is necessary for the building up of the body and to repair the waste that is constantly going on in it. By abstaining from food for a long time bodily activity cannot be kept up and health cannot be maintained at a high level. Quality of food consumed is as important as quantity. Those in good circumstances are always apt to eat more than is good for them. They apparently forget the homely proverb "Eat to live and not live to eat." Poor people on the contrary have to eat whatever they can get. They cannot afford to pick and choose. All food substances can be grouped into the following classes (1) nitrogenous materials or proteids, *e.g.* animal and vegetable albumins and gelatin, (2) fatty materials, *e.g.*, animal and vegetable fats and oils, (3) carbohydrates, *e.g.*, sugars and starches, (4) salts both organic and inorganic, (5) water and (6) oxygen. The last two have been dealt with already. The food materials as such cannot be made use of by the tissues of the body. They must first be subjected to a process of digestion in the stomach and intestines and get into the blood which carries the necessary nutrition to the tissues and organs of the body. The nitrogenous foods or proteids consist of nitrogen in combination with oxygen, hydrogen, carbon, sulphur and phosphorus. The proteids may be derived from the animal or vegetable world. Animal proteids occur in all kinds of meat, fish and cheese or milk. Vegetable proteids mostly occur in peas, beans and other leguminous seeds. As a rule, animal proteids are more easily digested than vegetable proteids. They are acted upon by the gastric and pancreatic juices and converted into peptones which are absorbed into the circulating blood. These are essential for the growth, maintenance, repair and functional activity of the tissues. During life, nitrogen is eliminated as urea and urates. Assimilation of excess of nitrogenous foods especially in the absence of sufficient exercise is apt to lead to imperfect oxidation with formation of uric acid and urates rather than urea. Liver becomes engorged with blood, its functions are impaired, causing fever, diarrhœa and ultimately gout. Deficiency of nitrogen in the food causes a diminution of circulating albumen, anæmia, loss of weight and impairment of energy and stamina.

Fats and carbohydrates are oxidisable substances pro-

ducing heat and force and are eliminated as carbonic acid gas and water. They aid in the nutrition of tissues and in the excretion of waste matter. An excess of either lessens oxidation of nitrogenous food and leads to storage of fat in the tissues. A deficiency causes increasing metabolism of circulating albumen, loss of weight and impairment of nutrition. Carbohydrates are more easily assimilated than fats but have a lower nutritive value by at least 40 per cent. They are converted into grape sugar by the digestive juices. As a rule, nutrition ultimately suffers if either fats or carbohydrates are withheld, but to a certain extent they are interchangeable as, for instance, the diet of an Eskimo has little or no carbohydrate.

The fatty tissue in the body is useful on account of its non-conduction of heat, lubrication and soft elastic pressure. It also acts as a store of food on which the body tissues can draw during starvation or illness. In excess it becomes a source of inconvenience or danger as in extreme obesity and fatty infiltration of the heart. Muscular contraction is the source of animal heat as well as force and the heat generated is four times the heat-equivalent of the work done. Though fats and sugars supply the fuel for these purposes, it is essential that a certain amount of nitrogenous matter should be associated with them. Fat or sugar alone is not enough.

Salts.—Lime is necessary for bone formation and cell growth, potash for nutrition of solid tissues and soda for fluid tissues. Small quantities of iron are required for the formation of Hœmoglobin (*i.e.*) the red colouring matter of the blood. Chlorides and phosphates are indispensable. Salts of organic acids, *e.g.*, lactates, tartarates, citrates, malates and acetates are oxidised into carbonates in the body and are important for maintaining the alkalinity of blood.

For a man doing a moderate amount of muscular work a daily dietary consisting of about 125 grammes or about 4½ ounces of proteids, 500 grammes or about 18 ounces of carbohydrates and 50 grammes or about 1¼ ounces of fat, will provide for the evolution of the usual body heat as well as for the upkeep and repair of the tissues of the body. No single article of diet contains the proteids, carbohydrates and fats in proportions, suited to the needs of the adult human body. Hence, rice and other cereals which contain carbohydrates chiefly, have to be supplemented by pulses, *e.g.*, dhall on account of their proteids

and by fats, *e.g.*, ghee or oils. Lean meat which chiefly, consists of proteids has to be supplemented, by bread or rice which contains carbohydrates, and by fats in the form of butter or dripping. Economic considerations enter into the formation of dietaries as vegetable foods are much cheaper than animal foods in most countries. For hard work carbohydrates should be greatly increased as they form the source of muscular energy. For one at rest, proteids should be greatly reduced. For mental work, the digestibility of food is of greater importance to the brain-worker than its chemical composition. Age, sex, climate, season, religious and social customs and personal peculiarities must be considered when drawing up dietaries. More food especially fats is needed in cold climates and less in hot. It may be said that a man consumes daily about 1—100th of his weight of dry solid food and 3—100ths of water. Women require about 10 per cent less food than men. Infants require nitrogenous and fatty foods with very little carbohydrates which must be in the form of milk-sugar. A baby under 7 months cannot digest starch at all and it is hardly fair to expect it to thrive on the numerous patent foods which all consist of starch or some form of it. A child of 10 years needs only half as much but at 14 years quite as much as a woman. The dietetic requirements of old age are just the reverse of those of childhood.

Animal food has certain advantages over vegetable food. It has a ready supply of blood pigment and has a larger percentage of proteids. Animal fats are more easily digested. The bulk of the food to be consumed is greatly lessened. A vegetable dietary is apt to contain insufficient proteids but it is rich in carbohydrates. It is bulky, less digestible and less completely absorbed. Vegetarianism as usually practised does not exclude animal fats or even nitrogenous matter, as milk, butter, butter-milk and cheese are used freely. But a consistent vegetarian avoiding all foods derived from animals must either live on a diet deficient in proteids or consume an excessive bulk of food. The former course lessens energy and tissue resistance and the latter causes derangement of digestive organs.

An excess of food due to too large or too frequent meals may accumulate in the intestines causing fermentation and dyspepsia with constipation or ineffective diarrhœa. Gout, obesity, gall-stone, etc., may also arise. Products of putrefaction may be absorbed and cause fever, furred tongue, fœtid breath, heaviness and jaundice.

Insufficiency of food for a long time, causes wasting of the tissues, especially of the fatty tissue. The attendent physical and mental weakness and anæmia will predispose the organism to diseases, *e.g.*, relapsing fever consumption, pneumonia, etc. Death ensues when the loss reaches about 40 per cent of the normal weight of the body.

When children are fed habitually on a diet having excess of starchy matter and too little of fats and proteids they get rickets. When the diet of an adult does not include fresh vegetables or fruits or their juices, a disease known as scurvy is produced. It is due to a deficiency of citrates, malates and tartarates of potash.

Animal Food.—Meat is often spoken of " white " meat and " red " meat. The former that of a fowl or a rabbit is less nitrogenous more tender and more digestible than "red" meat, *e.g.*, beef and mutton. Good meat should be firm and elastic but not tough. It should not pit on pressure. Cooking causes the coagulation of albuminous matter, renders the meat soft and tender by converting the connective tissue into gelatine. It also lessens the amount of water and of extractives. Boiling in the ordinary way causes a loss of 25 per cent or more but most of the soluble salts and substances may be retained in the meat by plunging it for five minutes in boiling water and then continuing the cooking at a lower temperature. The loss is greater in roasting than in baking and least in boiling. If the temperature does not reach 160° F., the meat is under-cooked. If it exceeds 170° C., the tissues shrink and become hard and indigestible.

Fish are generally nutritious and digestible but wanting in fat. They should be perfectly fresh and the least decomposition renders them unfit for food.

Milk.—Cow's milk is the most commonly used. It is a complete food as it contains about 4% of each of proteids, fats, milk sugar, ·75% of salts, the remainder consisting of water. Though many human babies thrive on cow's milk, it is not really suited to their needs as the proportions of the various constituents differ much from those in human milk. Many attempts are made to humanise the cow's milk by the addition of milk sugar, cream and water to bring it up to the standard of human milk. Cow's milk renders itself liable to adulteration on a large scale. Buffalo's milk is richer in fats and is not so easily digestible for children as cow's milk. But a

large proportion of milk sold in the bazzar as cow's milk is nothing but buffalo's milk diluted with 2 or 3 times its volume of water. Skimmed milk, *i.e.*, milk deprived of its fats by churning is a valuable food for adults though it is not sufficiently nutritious for children on account of the absence of fats. Many brands of condensed milk on the market are prepared from skimmed milk (also known as separated milk) and hence are unfit for children. Milk from tuberculous cows contain tubercle bacilli and hence it is wise to boil all milk intended for either children or adults. Milk left to itself soon turns sour from the formation of lactic acid by the lactic acid bacilli. Sour milk or more commonly known as butter-milk is a good and easily digested article of diet. The degree of sourness depends upon the time allowed for the action of the lactic acid bacilli.

Ghee consists of butter clarified by the removal of water and organic matter. It keeps better in tropical countries than butter which would become rancid in a short time. On account of the high price ghee commands, it lays itself open to adulteration with cheaper animal fats.

Vegetable Foods.

Rice is the staple article of diet in Southern India. When properly cooked, it is easily digested but it is poor in proteids, fats and salts. The ordinary method of boiling rice in an excess of water and throwing away the conjee is a wasteful process. The conjee is nutritious, containing part of proteids and salts, and the rice, poor as it naturally is, is rendered all the poorer by the conjee being thrown away. The proper method of cooking rice is by adding just sufficient quantity water and then steaming it for about one hour. Rice should be kept for at least six months after it is harvested as new rice is unwholesome and causes digestive disturbances. Rice should not be too highly polished as the rice bran is thus altogether removed. Recent experiments appear to show that a disease called Beri-Beri is produced by the consumption of too highly polished rice. Being rather insipid, rice must be mixed with some condiments to make it palatable. From a dietetic point of view, condiments do not supply any energy nor do they assist in the formation or repair of tissues. Their use consists in supplying some organic

acids and stimulants to the stomach which has to digest a large quantity of bland and tasteless food like rice.

Ragi is the important article of diet in the Mysore Province and its use is spreading in other parts of India. It is more nutritious than rice but is not so easily digested. The cooked ragi flour cannot be chewed and thus no opportunity is given to the action of the saliva on the starch in the ragi. Possibly the habit of chewing betel and nut helps to correct the want of mastication of ragi flour itself, as the abundant saliva secreted during the chewing of betel and nut, acts on the starch of the ragi in the stomach for a time before the contents become very acid. Old ragi grain which has become black emitting a musty odour should not be eaten as it causes digestive disturbances which may end in death.

Maize or Indian corn is superior in nutritive qualities to ragi and rice but it is more difficult of digestion. The maize-flour is generally baked in the form of cakes and can be preserved for a number of days. It also requires the addition of fats and condiments to stimulate the stomach.

Wheat is extensively used all over India but it is the staple article of diet in the northern parts. Indians use it in the form of cakes but Europeans as bread. Wheat is more nutritious than rice and is digested almost as easily as rice. It is rich in albumen known as Gluten and in carbohydrates but like other cereals poor in fats, salts and organic acids.

Leguminous Food-grains are known as pulses. They contain plenty of proteids from 21 to 35 per cent along with starch, fat, salts and water. By themselves they are very indigestible but when added in moderate quantity say 2 to 4 ounces to rice or ragi, they supplement the deficiency of proteids in the cereals. They must be subjected to prolonged cooking, otherwise they produce diarrhœa and may be passed undigested. The most common of the pulses are "dhall," Bengal gram, green gram and "avaray." The green gram appears to be the best of the lot. The groundnut in addition to containing 25 per cent of proteids contains about 50 per cent of oil and 20 per cent of starch. It is however very indigestible. The soy bean is largely used in China and is cultivated in Northern India and Burma. It contains 35 per cent of proteids and 19 per cent of oil. Its use is not very common at present but deserves a more extended trial.

Vegetable Oils most used as food, are cocoanut oil, gingelly oil, ground-nut oil and cotton seed oil. These are inferior to ghee and animal fats in the matter of digestibility but are cheaper and less liable to adulteration.

Sugar is an excellent form of food requiring no digestion and easily absorbed. It is of great use in wasting diseases and in persons doing hard bodily work. The sugar that is commonly used in India is that derived from sugarcane. Jaggery is the unrefined form of sugar and from a dietetic point of view quite as good as refined sugar. In Europe, most of the sugar is obtained from beetroot.

Vegetables and Fruits.—Vegetables are necessary in a dietary, giving proper flavour to the food and making it palatable. Green vegetables taken in moderation help to prevent scurvy and to correct constipation. Fruits when ripe and taken in moderate quantities supply organic salts and tend to improve the quality of blood. Many of them, *e. g.* Bananas, jack fruit and mangoes are very nutritious. Unripe or over-ripe fruit should never be eaten, especially in times of cholera or epidemic diarrhœa. Vegetables should be either boiled or better steamed or fried in oil and mixed with the usual condiments.

Condiments should not be used in excess. They should be taken in just sufficient quantity to impart a pleasant flavour to the food. Used in moderation they stimulate the secretion of the digestive juices and help in digestion. By themselves they have no nutritive value. The usual condiments consist of tamarinds, limes, turmeric, aromatic leaves, fruits and seeds of capsicum, coriander, pepper, etc.

Nuts, *e.g.* cashew nuts, almonds, walnuts, Brazil nuts, cocoanuts, etc., contain plenty of oil and proteids and are valuable articles of food. Some people live wholly on nuts, fruits and milk. But unless well masticated and taken in moderation they are apt to disagree with the majority of people and set up digestive troubles. But as occasional adjuncts to the usual foods they are valuable.

Aerated Waters are now being used by large numbers of Indians who have acquired an artificial taste for them. If good and pure water is used and the aeration is done in clean premises, no harm is likely to result from their moderate use. It is not desirable to use them in too large quantities or immediately after food. The carbonic acid gas dissolved in water tends to distend the stomach

too much and produce discomfort. But when used in moderation and on a not too full stomach they do good, allaying any irritation and tending to check nausea and vomiting.

Beverages.—In addition to the use of ordinary and aerated waters most people resort to various beverages, *e.g.* sherbets, alkaloidal drinks, fermented liquors and distilled liquors.

Sherbets consist of syrupy fluids flavoured with juices of fruits, *e.g.*, limes, oranges, grapes, pomegranates, and various aromatics, *e.g.* cloves. In hot weather if taken in moderation, and well cooled they are harmless and have a cooling effect.

The important **Alkaloidal Drinks** are tea, coffee and cocoa. The alkaloidal constituent of tea is theine to which are due the refreshing and stimulating properties of tea. If infused for more than 3 minutes in boiling water the infusion contains tannin which is apt to cause indigestion and constipation. It is best to infuse the leaves for 2 minutes in boiling water and pour off the infusion into a separate vessel. When mixed with milk and sugar it is a real food but the Chinese and Japanese drink the infusion unmixed with anything and use it as a beverage instead of water. The value of tea depends upon its fine flavour. Excessive drinking of tea is bad especially when fasting. It causes indigestion, constipation, sleeplessness and loss of appetite. When used in moderation, it stimulates the nervous system. Indian tea contains more tannin than China teas and should therefore be infused for a very short time.

Coffee contains an aromatic oil and an alkaloid caffeine which is practically identical with theine. In England, coffee is always mixed with chicory. Pure coffee berry should be roasted and then powdered and infused in boiling water. The addition of milk and sugar increases its nutritive value. Caffeine has the same stimulating effect on the nervous system as theine has. If coffee is infused too long, tannin will get into the solution.

Cocoa contains the alkaloid theobromine which resembles caffeine and theine. It has also about 50 per cent of fat, more than half of which is removed in the manufacture of cocoa. It has also some proteids and carbohydrates, so that cocoa is more of a food than tea or coffee. The addition of milk and sugar increases its nutritive value. Cocoa has hardly any stimulant action.

Chocolate is a preparation of cocoa from which most of the fat has been removed, mixed with sugar and flavouring substances, made into a paste and finally pressed into moulds.

Fermented and Distilled Liquors.—The former are beer, ale, porter, stout, wines and cider. In all these drinks, part of the sugar found in malted barley or grape juice or apple juice is converted into alcohol by some species of yeasts. The amount of alcohol varies from 4 to 15 per cent. These drinks are taken for the sake of the exhilerating effects of alcohol. In parts of Mysore Province, an intoxicating liquor known as "Akki Bhoja" is made by allowing rice to ferment and adding various bitters. Distilled liquors are spirits, *e. g.*, brandy, whisky, rum, gin and arrack. These are prepared by the distillation of previously fermented liquors, *e.g.*, wines, malted barley and molasses. The use of alcoholic beverages is unnecessary to healthy persons. In some exhausting diseases, alcohol may be prescribed in medicinal doses. Habitual use as a beverage leads to excessive consumption. Diseases of stomach, liver, kidney and nerves are very common in excessive drinkers. There also ensues rapid physical, mental and moral deterioration. It is therefore best to avoid their use altogether.

Cookery.—Good food is often rendered distasteful by bad cooking, while indifferent food is often made palatable by good cooking. Especially with regard to vegetable diet, good cooking is essential to render various cereals, *e.g.*, rice, ragi, etc., easily digestible. It makes food more wholesome by destroying disease germs. The various condiments including common salt, usually added to dhal and vegetables should be in such moderate proportions as to render the food palatable. Cooked food should not be kept uneaten for a long time, as it is liable to various contaminations and putrefactions. Flies should be prevented as much as possible from sitting upon any eatables. Flies generally breed in heaps of manure or filth and when they settle on food intended for human beings they leave their own excreta on the food or lay their eggs therein or in trying to feed they may contaminate the food by any dangerous bacteria they may be carrying on their legs or wings. They act as mechanical carriers of infection by settling first upon excreta and then on food stuffs. Cholera, dysentery, epidemic diarrhœa, typhoid and allied fevers are thus propagated by the agency of flies.

It is therefore imperative to protect all food materials from infection by flies.

Personal Hygiene includes everything that concerns one's own health. This depends greatly on habits acquired in early childhood when the personal example of the parents has much influence in moulding them. It is possible to acquire either good or bad habits later in life but it is much more difficult to break away from early habits as well as those acquired later. Social customs of the community to which one belongs also exert some influence on one's health. As mothers take such prominent part in the training of children, they must be brought to see the evil in so many social customs, *e.g.*, pollution of drinking water by bathing in tanks and rivers, fasting on certain days and feasting to excess on others, suckling the children for too long a period, too early and even infant marriages, etc. This can only be done by giving as good education to women as is given to men. The disproportion now existing between the education of boys and girls must cease.

The most important factor in personal hygiene is *eating and drinking.* In the case of adults, two good meals a day with some light refreshment in the interval is all that is necessary. The hours for the meals should be regular and one must get into the habit of taking food at stated hours, as in that case the stomach will become educated to expect the food and deal with it properly. If food is supplied at irregular hours, the stomach may for a time do its work but as age advances it is bound to become deranged. Too much food should not be taken when one has to do any physical or mental work as it induces a sleepy feeling. So much blood is drawn to the stomach that brain and muscles have not enough for their needs. The principal meal of the day should therefore be in the evening between 7 and 8. If breakfast is taken at 10 A.M. the interval between it and dinner is too long and therefore very light food should be taken at 3 P.M. But if one has a substantial breakfast at 12 noon or thereabouts, no lunch or tiffin is needed. Young growing children should have at least 4 meals a day, one early in the morning, another at 11 A. M., 3rd at 3 P. M. and the last 7 P. M. What should be aimed at are regularity of hours and moderation as regards quantity.

The practice of allowing children to partake of food which has been partly eaten by their elders, should be

discouraged. Certain people consider it a sign of good friendship if they eat out of the same plate. Recent discoveries show that many apparently healthy people harbour in their bodies dangerous disease germs such as cholera, typhoid fever, consumption and if such people are allowed to infect the food which is being eaten by others, the danger of the spread of disease to healthy people is evident. Therefore, each person irrespective of age and relationship should be provided with a plate or clean leaf and have the meals served separately. Metal plates, especially those of aluminium being comparatively cheap, should be used in preference to leaves. Fresh plantain leaves, well washed with clean water are no doubt good but everybody cannot afford them for daily use. Dry stitched leaves should be avoided wherever possible. Aluminium plates will come cheaper in the end as they can be cleaned every time they are used.

All young people should be taught to chew the food carefully and eat slowly. Excessive use of condiments and spices should not be encouraged. Plain and well cooked food should be attractively served. Special care should be taken to keep the right hand clean as we make no use of spoons and forks. After eating too, the hands should be properly washed with soap and water. The mouth should be well rinsed with clean water and all particles of food sticking between the teeth should be carefully removed, as otherwise the food particles will begin to putrefy and the organic acids produced will cause the wearing away of the teeth. Decay of the teeth will also be brought about in this way. While taking meals water should not be drunk very often or very copiously. The saliva ought to be enough to enable the solid food to be swallowed without any difficulty. At the end of a meal a large tumblerful of water may be taken. As much water as one cares to drink may be taken an hour before meals or 3 or 4 hours after meals. Food should always be taken in moderation, whatever may be the opportunity or the temptation. Young growing people may eat freely but persons past middle age must be very sparing in their diet. Aerated non-alcoholic drinks may be taken in moderation and do no harm. It is best to abstain altogether from fermented or distilled alcoholic liquors. Habitual use of alcohol even in moderation renders a man less capable of work both mental and physical. It interferes with the oxidation of waste matters and then allows

them to accumulate in the body. It especially interferes with the functions of the liver and kidneys. More important than all this, it lessens and even deadens the moral control of persons addicted to its use. Another common habit is that of smoking tobacco. Boys learn it by imitating their elders and consider it to be fashionable. Persons under 21 are best without it. Later on strict moderation in smoking appears to do no harm. Excessive smoking in persons past middle age irritates the nervous system too much. Using snuff is not quite as bad as smoking but it is a very dirty habit. It is not so common now as it used to be. Chewing of tobacco especially in large quantities exposes one to the danger of nicotine poisoning. Worse than tobacco smoking is the smoking of opium which is extensively practised by the Chinese. The physical, mental and moral effects have been so very bad that serious efforts have been made to discourage the practice and to put a stop to the importation of opium into China. Habitual eating of opium or any of its preparations is every bit as bad as smoking it and these habits should never be acquired. Another bad habit is the eating or smoking of ganja. It is worse in its effects than even opium or alcohol. It makes the persons addicted to its use raving maniacs and helps to fill lunatic asylums. The eating of cocaine is another dreadful habit. It ruins the victim beyond all hopes of recovery. Strong measures are being taken in Bombay, Calcutta and Rangoon against those engaged in the nefarious traffic of smuggling cocaine into India. The least injurious habit is the chewing of betel and nut. It has a slightly exhilerating effect but the habit of spitting the red juice indiscriminately renders it very dirty. Even persons who do not use betel and nut have a habit of spitting indiscriminately. That this is a filthy habit every one is agreed. But when the sputum comes from persons suffering from tuberculosis of lungs, pneumonia and other diseases, indiscriminate spitting becomes positively dangerous. If spitting is unavoidable a spittoon should always be used and the contents frequently disinfected or better burnt. Pocket spittoons made of paper are available and should be made use of and subsequently burnt. The practice of spitting into the pocket handkerchief is both disgusting and dangerous.

Sleep.—Both body and mind need regular periods of rest when they recoup their energy. Deprivation of sleep

for a prolonged period may cause insanity and even one's life may be in danger. Infants should sleep not less than 12 hours a day, young boys and girls at least 9 hours and adults about 7 hours. Many people manage with much less but they are exceptions to the general rule. Night is the best time for sleep. The habit of sleeping for an hour or two during the day would naturally interfere with good sleep at night. One must not go to bed immediately after food. At least an hour or more should elapse between supper and the time for sleep. If possible cots should be used to lie upon. Sleeping on the floor interferes with free circulation of air around and under the sleepers, renders one liable to the attacks of snakes, scorpions and other animals and favours the breathing by the sleeper of all exhalations from the ground. Bedding and sheets should be clean and frequently washed. Windows should be kept widely open to allow of free ventilation, more especially if more than one person sleeps in the same room. The body should be covered up warm. The head should not be covered up as otherwise the same air is liable to be breathed over and over again. Where mosquitoes, especially malaria transmitting mosquitoes abound, a mosquito curtain should be used by all those that can afford it. No plants should be kept in the sleeping room. Personal cleanliness is absolutely necessary for the preservation of health. Teeth should be well brushed at least once a day. Particles of food should not be allowed to collect in the spaces between the teeth. For this purpose, the systematic use of a tooth-pick is necessary. Tooth powders and mouth washes may be used by those that can afford them. Poor people may use finely powdered charcoal mixed with a little common salt for brushing their teeth with the fingers. Sand or any other gritty material should never be used for cleaning the teeth, as the enamel is liable to be worn away, rendering the teeth liable to decay.

The skin is an important organ of excretion and should receive attention. Dead epithelium, dirt and grease which collect on the skin should be removed by the daily use of soap and water. To a healthy skin cold water acts as a stimulant. Warm water may be used by those not accustomed to cold water. Anointing the body with oil and then washing it off with soap-nut and hot water is very useful in cleansing the skin and keeping it soft. The water used should not be too hot. If very hot water is

used the person is enervated after the bath. The European method of sitting in tubs with hot or cold water has a greater and more lasting effect than the Indian method of pouring the water over the body. Remaining in cold water in a tub for 10 minutes or more acts as a tonic to the skin. Remaining in a hot bath for 10 minutes would cause dilatation of the blood vessels of the skin and promotes free perspiration after getting out of the bath. After such a bath one must avoid exposure to a cold draught. After a bath or washing, the skin should be rubbed dry with a towel. The friction assists the skin in the performance of its normal functions. Wet clothes should not be allowed to cling to the body for any length of time especially when one is bathing in the open air.

The nails, more particularly of the fingers, should be periodically pared and kept clean. They should not be allowed to grow too long as they afford spaces for collection of dirt. Many boys and even a few adults get into the bad habit of biting the nails. This is a dangerous practice not to say anything about its being disgusting. Many cases of whitlow are caused by the infection of any small scratch or wound near the nails, with the microbes found in the saliva.

Clothing.—Comparatively little clothing is required in a warm country like India. In the hot season, the problem is not to keep the body warm but cool. Clothing should then be reduced to the scantiest limits consistent of course with decency. The very young and the very old are extremely susceptible to changes of temperature and so need greater care in clothing. Cotton clothes are the most suitable for the Indian climate but to those who have adopted the European dress cotton or silk underclothing next the skin and garments made of Tassar silk or light tweed over the underclothing would be enough. The use of loose shoes is the best but those using European boots and shoes should be careful to select such as do not press on the toes or distort them. Use of very tight waist bands over the "saris" should be discouraged in the case of Indian women. Woollen materials are hardly suitable in India but for those who take vigorous exercise in the open air, woollen underclothing is to be recommended as it absorbs the perspiration and does not chill the body as cotton is liable to do. Wool and silk are non-conductors of heat and should form the substance of clothing where the preservation of the body heat becomes necessary.

These however are expensive and do not wash as well as cotton. Water proof materials for those going out in wet weather are useful. Black and dark colors absorb heat and should be avoided in the hot season, when white and light colors are suitable. Some of the dyes used contain arsenic and the use of such colored articles would set up local irritation of the skin and even general poisonous symptoms if it happens to be absorbed. It should be remembered that no article of dress from head to foot should be so tight as to obstruct the general circulation of the blood.

Exercise.—Within limits exercise is absolutely essential for the preservation of health. To be of the greatest use, it must be in the open air. An exercised muscle grows, thickens and becomes stronger. General exercise also means the healthy use of the muscles of the heart, muscles of respiration and muscular tissue of arteries and of all parts capable of movement. There is also increased activity of the brain and nervous system and of both secreting and excreting organs. Sudden and violent exercise should be avoided as it throws unaccustomed extra work on the heart which may lead to palpitation, valve disease, etc. During exercise, the amount of oxygen taken and the amount of carbonic acid given out are greatly increased. When the exercise is excessive, circulation in the lungs may be impeded and breathing may become laboured. If muscles are continuously overexercised, they may actually waste on account of the damaged nutrition of their fibres, accumulation in them of waste products and exhaustion of a supply of oxygen. A diseased muscle will always undergo wasting, the muscular fibres undergoing fatty degeneration. Moderate exercise stimulates a desire for food and causes a more vigorous action of the abdominal viscera and lessens a tendency to constipation of the bowels. During exercise, the skin acts vigorously secreting plenty of perspiration. This lessens the action of the kidneys. Each person must find out for himself or herself what and how much exercise he or she can take with advantage to himself or herself. No hard and fast rules are possible. Training is necessary for long continued exertion. Taking good exercise, doing hard work, while the food eaten is deficient in quantity or poor in quality would lead to fatigue, wasting and even exhaustion and fainting. For average men engaged in sedentary occupation a two hours' walk

at a moderate pace is sufficient exercise for a day. All the work that a labourer does is really exercise and no further exercise is necessary for him. What he needs is recreation after work. Each man or woman must choose for himself or herself the kind of exercise he or she has to take, *e.g.* walking, running, cycling, riding, open air games, *e.g.*, tennis, cricket, football and athletic exercises.

Breathing.—Breath should always be taken through the nose and given out through the nose. Many people have got into the bad habit of breathing through their mouths. By breathing through the nose the air is properly warmed and moistened and partly deprived of germs and solid particles suspended in it. By breathing through the open mouth, the air taken in, is chilled and not deprived of any suspended matter. The throat becomes irritated and a hacking cough is set up. Children should be taught to breathe through the nose both when awake and asleep. By always keeping the mouth open, a child comes to have in time, a dull heavy stupid look. The chest is not properly expanded and circulation of blood is impeded. Disease germs, *e.g.* tubercle bacilli, find easy lodgement in the lungs giving rise to consumption. It is very good to practise deep breathing exercises every morning and evening for ten minutes at a time.

Mental Training is necessary as mind has great influence for good or evil on the body. Worry, anxiety, care and disappointment and all depressive emotions, *e.g.*, sorrow, have an injurious effect on health, while good health can be kept up only by a contented mind kept under control. It must not be forgotten that bodily condition also influences the mind, a healthy body being conducive to a calm mind whereas ill-health depresses the mind making it take a gloomy view of everything. Constant training of both the body and mind is necessary to keep a healthy state of equilibrium. Hours of study should not be too long. Whenever possible, the light for reading should come from one's left or from behind. Very strong light should not be used for reading purposes. Diffuse daylight is the best. If electric light is available, it can be used for reading at night. Otherwise a good lamp burning refined kerosene will do. Cheap and badly refined petroleum oils should not be used, as during burning they give off many gases, the breathing of which, especially in an ill-ventilated room, produces deleterious effects on the body. Books printed in very small type should be avoided as the

eyesight is spoiled thereby. The increase of short-sight among the school-going population is directly due to the constant reading of badly printed books, in insufficient light. Reading in Railway trains or in vehicles in motion is not conducive to the preservation of good sight. When mind is fatigued either rest or light bodily exercise or a change of the subject of study will revive the mind. Cramming the mind with a lot of facts useful only for examination purposes is quite as bad as cramming the body with food for increasing the weight.

Marriage as a social institution is necessary for the preservation of race, and for the gratification of the sexual desires normally present in every healthy individual. Amongst the Europeans marriage is a civil contract for a man and a woman to live together as husband and wife and for their children to inherit any property they may have. Religion has comparatively little hold on marriage and even that little it is losing gradually. Divorce is permitted for sufficient reasons shown by the one or the other party. Amongst the Hindus however marriage has become so inextricably mixed up with the religious rites that it has ceased to be a civil contract and the parties are bound to each other for life, such a thing as divorce being unknown. The idea of a son being absolutely necessary for saving the ancestors from a certain kind of hell and for the performance of funeral ceremonies and annual repetitions of the same on a smaller scale, has become so ingrained in us that the mere thought of a girl remaining unmarried or of a boy being celibate for life without renouncing the world like a "Sanyasin", has become abhorrent. In ancient times when the Hindus were free and under their own rulers a young man was expected to get married at 21 years of age after finishing his studies with his teacher, to a girl of from 16 to 18 years of age. This was an excellent arrangement and worked well in practice, the contracting parties being able to judge for themselves whether they liked to be partners for life. The progeny also would, under such conditions, be strong and healthy. But when the Hindus came under an alien rule they found that any girls left unmarried were liable to be carried off by the ruling class who however respected the sanctity of marriage and did not molest married girls. Thus the custom of betrothing girls in their very young age to some boys of equally tender age came to be the practice. The consummation of marriage was in many cases no doubt, but not

always, postponed till the girl menstruated, but all the same, evils of early marriage became manifest in the loss of vitality of the married parties and of the puny weaklings they brought forth into the world. The great rise in infant mortality is due to this cause. The Hindus as a nation have undergone degeneration in their physique, vitality and mental power. The very large number of deaths among men aged from 25 to 40 is due to their wasting their vitality in sexual matters at too early age. But under the British rule there is no fear of girls being carried off by force but such is the strength and tyranny of custom that the evils of early marriage are being perpetuated up to the present day. The more religious and orthodox a man believes himself to be the earlier he ought to get all his daughters married. Unfortunately, the great opponents of reform are not the men so much as the women folk. The only remedy for this state of affairs is female education. Early marriage prevents the proper physical and mental development of both husband and wife and causes a diminution of manliness and energy in a man and exposes the girl to premature child-bearing. The offspring has less vitality, less power of resistance to disease than children of grown-up parents. Sexual indulgence before full bodily development, is attended by disastrous consequences to health. Married boys are unfit for hard study and to withstand the keen competition in latter life with others who are more favourably situated. The evils of early marriage are prevalent chiefly among Brahmins and those who slavishly imitate the Brahmins hoping thereby to elevate themselves in the social scale. Amongst those who do not belong to the exclusive Brahmin caste, there is no ordinance, religious or otherwise, enjoining early marriage. But if they choose to adopt the evil customs of others less fortunately situated than themselves, they are bound to suffer.

Some mothers are in the habit of giving breast to their children for 2 to 3 years or even more. This pernicious custom is by no means uncommon and is solely due to ignorance. A child should be weaned from the mother's breast when it cuts its first tooth, that is, when it is about 7 to 8 months old. It is nature's indication that the child is able to digest starchy foods and need not be dependent any more on mother's milk. The health and strength of the mother will be seriously undermined by long continued secretion of the milk and her chances of future healthy and uncomplicated pregnancies are greatly jeopardized.

Intermarriage of near blood relations is very objectionable as the offspring tend to inherit any weakness or tendency to disease common to their ancestors. Persons suffering from tuberculosis, leprosy, syphilis, insanity, etc., should be discouraged from marrying and propagating their species or their diseases.

Houses.– The best site for building a house is the summit of a slope with dry gravelly or clayey soil with a low level of sub-soil water. Houses should not be built at the foot of a slope as it receives the drainage from the higher ground. Places where the level of the sub-soil water is high should be avoided. Marshy places are dangerous on account of their liability to breed malarial mosquitoes. Presence of trees is no objection unless they interfere with light and circulation of air. Houses should not be placed in close proximity to rice-fields.

Every house should have a basement and be above the level of the street and the drains therein. To prevent damp from rising into the walls by capillary attraction from the soil, a series of stone slabs should be placed in the foundations and walls built on them. This would also obviate the walls of any room being in contact with the soil. Every room should be provided with a sufficient number of windows to allow through ventilation. Light and air should have access to all parts of the house. Back-to-back houses should never be built as there can be no through ventilation in such houses. The ideal to aim at is to have no two houses contiguous to each other. In towns where this is not possible, fronts and backs of houses must be free to allow through ventilation. The roofs should either be terraced or covered with Mangalore tiles. In the latter case, the roof must project a little outside the walls so that the latter may be protected from rain. The floor should never be allowed to be damp. It should consist of some hard impermeable material or better of Cudappah stone slabs. In any case, it should be such as to afford no facilities for rats to burrow holes. It is by building rat-proof houses that plague can be kept away from any town or village.

The house should be kept clean and tidy. The floors should not be smeared with cow-dung but swept and if necessary washed with clean water. Accumulations of dust and dirt should be avoided. This would afford no footing for disease germs in the house. Manure and night soil should not be stored anywhere near the houses as they

form breeding grounds for flies. Any houses in which flies abound are sure to contain manure heaps close by. Flies are mechanical carriers of infection in many diseases, *e. g.*, cholera, dysentery, epidemic diarrhœa, typhoid and allied fevers. It is therefore highly important that there should be no collections of manure and night soil in or near dwelling houses. They must either be removed into distant fields or they must be disinfected by means of chloride of lime (*i. e.*) bleaching powder.

The sewage of each house must be led by means of a proper drain into the street drain. If the streets have no drains then the sewage may be utilised for gardening in the backyard. If this is not possible the sewage must be collected in shallow pits and periodically removed in buckets to distant gardens or fields. On no account should the sewage be allowed to soak into the earth round about the house. This will not only create a nuisance round the house but will form breeding places of mosquitoes. Each house must be provided with a latrine built in the backyard as far away from the house and the well as possible. It is best to have daily conservancy and remove the filth every day. In many places, this is not possible as there are no scavengers to do such work. In such cases, small pits, not more than 3 to 4 feet deep may be made and the excreta covered every day by house refuse and ashes. The pit may be emptied periodically and the contents removed as manure to the fields.

Disease Germs.—In our efforts to preserve a decent state of health we have to wage incessant war against unseen foes. Some of them are always in or on our bodies and trying to get the upper hand on every possible occasion. The ordinary cold in the head to which almost every one is subject, is due to the attacks of germs on the body when its power of resistance is diminished by exposure to inclement weather. It therefore behooves every one who wishes to keep well, to know something of these disease germs. Some of these are animal germs and others vegetable. All of them are so minute that they can be seen only when greatly enlarged under a microscope. Malarial parasites and organisms producing sleeping sickness are examples of animal germs. The vegetable germs are far more numerous and are known as bacteria. Some are round and are known as Micrococci, others are rod-shaped longer than broad and are known as bacilli and others again are curved, long and wavy

and are known as spirillæ. All the bacteria multiply by the method of division while some when placed in unfavourable conditions produce spores which are able to resist want of food and of moisture and exposure to high temperature for a long time. The spores can revive and produce full-grown bacteria, when the surroundings are again favourable for germination. All bacteria can grow in presence of moisture, within certain limits of temperature and when supplied with suitable food. Some can flourish only in the presence of oxygen and others only in its absence. Most bacteria exist independently of a living host, getting their food supply from dead animal and vegetable material and from water containing organic and inorganic matters in solution. But a few bacteria live as parasites in the tissues of living animals and plants. Sometimes they do no injury to the living hosts but more frequently they act as harmful invaders giving rise to acute or chronic infectious diseases. Such disease producing parasitic bacteria are known as pathogenic and the harmless ones as non-pathogenic. The pathogenic power of bacteria is due to the poisonous or toxic substances produced by them during the period of their growth. Each bacterium is specific in its action, that is to say, it is associated with a particular disease. Thus tubercle bacilli produce only tuberculosis, anthrax bacilli give rise to anthrax and so on. A large number of other diseases, *e.g.*, tetanus, glanders, leprosy, typhoid and allied fevers, diphtheria, influenza, plague, cholera, dysentery, epidemic diarrhœa, Malta or Mediterranean fever, gonorrhœa, pneumonia, and suppurative processes are produced by particular kinds of bacteria. The question of a person being affected by a particular disease depends not only on the virulence of the bacterium but also upon the resisting power his own tissues possess. If the person attacked is in robust health and if his body cells are able to respond to the action of the invading bacterium he may show no symptoms of disease and may be said to be immune. Therefore immunity depends upon the body-cells being able to produce substances antagonistic to the germs and to their toxic products. The body-cells can do this only if the person is in good health. Otherwise, he will show signs of disease which are indications of the struggle for existence going on between the body cells on one side and the invading germs on the other. If the body-cells are victorious in the battle, the person is said

to recover from the disease. If, on the other hand, the invading germs gain the day, the person will succumb to the disease.

In many specific diseases recovery from one attack tends to protect the patient from subsequent attacks of the same disease. The protection is most complete in small-pox and less so in typhoid fever, diphtheria, influenza and plague. In erysipelas, consumption and septicæmia, no great protection is conferred by an attack. In all cases, protection diminishes after a lapse of time. The protection may be due to the fact that the body-cells and tissues have acquired a tolerance of the poison of a certain disease and that subsequent infection does not produce the former symptoms of disease. It may also be that protection persists as long as the antagonistic substances produced by the body-cells in response to the invasion of germs, last in the body. Hence, it follows that prophylactic inoculation against particular diseases is valuable, during their prevalence. Taking plague as an example, it is well-known that inoculation with the plague prophylactic confers protection against plague for 3 to 6 months, *i.e.*, while the epidemic lasts. Haffkine's plague prophylactic consists of the dead bodies of the plague bacilli and the toxins, *i.e.*, poisonous substances produced by them. When this mixture is injected into the body, the body-cells react to the dead plague bacilli and their toxic products and give rise to antibodies, *i.e.*, substances antagonistic to them. As long as these antibodies remain in the body, any living plague bacilli that may happen to be introduced and their products will be neutralised and the person is said to be immune for the time being. Small-pox is another disease against which protection can be obtained by the prophylactic inoculation which in this particular case is known as vaccination. The virus of small-pox has not been isolated but we have every reason to believe that it is a specific disease due to a particular germ. The inoculation material, *i.e.*, vaccine is derived from cow-pox, which is merely small-pox modified by transmission through the cow. When human beings are vaccinated with this cow-pox material, immunity is conferred against small-pox. This process of vaccination was not unknown in India in ancient times. There are said to be many references to it in the old Sanskrit Ayurvedic works. The immunity conferred by a single vaccination lasts for five to seven years. Revaccination made

seven years after primary vaccination is sufficient to confer a life long immunity.

Cholera and typhoid fever also can be combated by prophylactic inoculation in a manner similar to that of plague. Instead of having separate vaccines for each of the diseases and conferring immunity to one disease after another by a series of inoculations, it is possible to combine them all into a mixed vaccine and by a single inoculation afford protection against them all simultaneously.

Disinfection is the process by which the specific germs of the various diseases are destroyed. A disinfectant is therefore a substance which kills the germs. Sunlight and open air are true disinfectants, inasmuch as most if not all pathogenic germs are destroyed by sufficient exposure to these agencies. Even the poorest can make use of them as they cost nothing. But acting on the principle that what is not paid for is valueless, we neglect to make full use of air and sunlight, in our fight against diseases due to germs. In building houses, sufficient provision is not always made for the entry of these invaluable disinfectants. In fighting plague, one may derive the greatest benefit by exposing flea-infected articles to bright sunlight. Fleas cannot survive this treatment for more than a few minutes. Grain to which rats have had access, can be rendered safe by exposure to sun. Clothing which may harbour fleas may be similarly dealt with.

Each germ requires a particular disinfectant acting upon it in a particular way before it can be destroyed. Thus no one disinfectant and no single method of disinfection will serve in all cases. Heat is the best and the most thorough of all disinfecting agents, wherever it can be used. Infected articles of small value can be easily burnt, others which cannot be destroyed may be exposed to moist or dry heat. Fleas and other insects can be got rid of by spreading dry straw, cow-dung cakes, etc., on the floor and setting fire to them. Excreta of cholera and tyhoid patients, and sputum of consumptives, may be destroyed by being burnt.

All bacteria are killed by exposure to steam for five minutes or to hot air for four hours. Boiling water is as efficient as steam. Most of the infected articles of clothing can be disinfected by immersing them in boiling water and drying them in sunlight. Steam is useless for leather articles which tend to shrink while hot air renders them dry and brittle.

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There are a number of chemical disinfectants but their use in practice is not very satisfactory, and the process of disinfection is rather difficult. The most commonly used ones are solutions of perchloride of mercury 1 in 500, potassium permanganate 1 in 20, zinc chloride 1 in 40, carbolic acid 1 in 20, formalin 1 in 40 and chloride of lime 1 in 100. The last named is the best and cheapest for household use. It can disinfect cholera stools, tubercular sputum, and manure heaps stored near the houses. It prevents the breeding of flies when sprinkled over collections of filth and other organic matter. Emulsions containing kerosene oil can be used for killing fleas, when for any reason dry heat cannot be used. Kerosene oil or crude petroleum is useful for destruction of mosquito larvæ growing in stagnant pools. The use of slaked lime or in other words whitewashing is really a method of chemical disinfection for walls and roofing.

Disinfection by fumigation has practically fallen into disuse. The burning of sulphur in the streets during outbreaks of cholera has fallen into deserved oblivion, now that the real causitive agent of cholera has been proved to be a living germ passing out of the human body through the excreta and infecting open sources of drinking water, *e.g.*, wells and tanks. During epidemics of cholera, the safest thing to do would be to boil all suspicious water before drinking it. But in many cases this is not done in practice, either wilfully or through ignorance. The ordinary method of disinfecting wells is the addition of sufficient potassium permanganate to colour the water pink for 24 hours. A cheaper and perhaps better method would be to add a small quantity of bleaching powder. This would ensure the destruction of all excretal germs in an hour or two.

Chemical disinfectants when added in insufficient quantities do not kill the germs, but simply arrest their growth. Then they are spoken of as antiseptics (*i.e.*,) substances preventing sepsis or decomposition. Some antiseptics, *e.g.*, boric acid, borax, salicylic acid, etc., are used as food preservatives. When food stuffs containing such preservative are habitually used, they tend to set up digestive disturbances.

When an infectious disease, *e.g.*, small-pox, plague or cholera attacks one of the inmates of a house, various precautions ought to be taken to prevent the spread of infection to others in the house and to those in the

neighbouring houses. In the interests of the patient as well as of community, it is best to remove him to an Isolation Hospital where one exists. Large towns always make provision to treat persons suffering from infectious diseases in special hospitals. Even small towns may put up a few emergency sheds to which patients may resort and be under proper medical treatment. In cases where such provision is not made or where the patients or their relatives object to go to the Isolation Hospitals, some arrangements must be made to keep the patients apart from the healthy inmates. The best lighted and ventilated room in the house preferably on the ground floor should be converted into a sick room. Except a cot, a table and a couple of chairs, there should be no other furniture in the room. Only the medical attendant and the person doing the duties of a nurse should have free access to the sick room. The excreta should on no account be allowed to soil the floor. If accidentally soiled, chloride of lime should be sprinkled on the spot and cleaned at once. All excreta and remnants of food coming out of the sick room should be burnt and other articles that cannot be so dealt with should be immersed for a time in boiling water. Where the whole house consists of a kitchen and a living room, all these precautions cannot be taken. In such cases especially when the infectious disease is small-pox it is best to send away children to relatives or neighbours who can take care of them and keep the patient in the only place available, keeping the surroundings as clean as possible. All unvaccinated children should be vaccinated at once. Vaccination will modify the virulence of small-pox even though the children may be incubating the small-pox germ in their bodies. The doors and windows should be kept wide open allowing plenty of air and light to come in. The practice of keeping bunches of fresh neem leaves acts to some extent as a disinfectant. The doctor's instructions regarding the feeding of a patient should be strictly followed. Giving too much or unsuitable food without the knowledge or even contrary to the orders of the doctor, should always be avoided. In a case of cholera, no food whatever is necessary but the patient should be allowed to drink as much water (previously boiled and cooled) as he cares to have. The attendants on the patient should on no account drink or eat anything that has come into contact with the patient. In a case of

pneumonic plague, the patient should not be allowed to spit on the floor. The sputum should be received in a vessel containing some solution of phenyle or cyllin or other disinfectant. The attendants in such a case should take care not to face the patient directly, lest they inhale particles of sputum laden with virulent plague bacilli ejected when the patient coughs. The patient should be kept quiet and not disturbed with too much conversation. No reference should be made to the symptoms or the gravity of the case in the presence of the patient. In cases of plague, the patients should be kept in the recumbent posture and never allowed to get up or even sit up. The plague toxins have enfeebled the heart to such an extent that the simple exertion of trying to sit up is enough to stop the action of the heart once for all.

Compared with previous proof
MM.
13/3/15

22

G. R. S. 26] 15/2

Sany File No. 139-14
Serial No. /

Diary No. of letter replied to

Encs.

No. 6303 Sany 139-14-1
15.2.15

General and Revenue Secretariat
( )
the 191

To

The Superintendent,
Govt. Press

Date of issue 15.2.15.

Signed by for A.V. Ramanathan

Sir,

I am directed to forward herewith manuscripts of two pamphlets on "~~Hygiene~~ Hygiene" and to request that final proofs thereof, along with the originals, may be kindly sent to Dr. M. Srinivasa Rao, Director of Public

over.

SUBJECT.

93
42
/(

for Secy. 15/2

Health, by the 15th March
1915. for approval ~~and for~~
~~return to the Press, during~~
~~at the same time~~ and 2 spare
copies of the proofs sent to this
Office, also, at the same time, for information.

2. I am also to request that immediately on receipt of the approved proofs from Dr. Srinivasa Rao 5 clean proofs of each pamphlet incorporating the Corrections suggested by Dr. S. Rao ~~passed by them~~ may be sent to this Office ~~submitted to Govt.~~, ~~to reach the Office~~ not later than the 31st March 1915, at the latest.

3. I am also to add that Dr. S. Rao has been requested to return the final proofs corrected by him as soon as possible after their receipt.

Yours
15/2
obdt. Secretary
6304 Sanitary 915-2-15

Copy to Dr. S. Rao with
B/L. The request that the proofs
may kindly be returned to him
duly corrected as soon as possible
~~on receipt~~ after their receipt
~~10 days of their receipt~~
to facilitate the despatch of final clean copies
to this Office before the 31st March. H.C.
15/2 Sec'y

List of enclosures,

Copied by

Examined by

GPB—25,000—4-3-13

G. R. S. 26]

Sany File No. 139-14
Serial No. 2

Diary No. of letter replied to

Genl. File
No. 6801
Sanity 139-14-2
93.3.15.

General and Revenue Secretariat
( )
, the *191* .

To Lt Col. T. H. Hoolkes I.M.S.
Dumbar Physician &
Surgeon.

Date of issue 3.3.15

Signed by Mr D. M. Narasinga Rao.

Dear Sir,

I am directed to forward herewith proof Copies of an elementary manual of hygiene & also a manual of hygiene prepared proposed by the Dr Sanitary Commr to Govt to be published by Govt, and to request that I may be favoured with your suggestions early, with such additions, or omissions or alterations which you may consider necessary. You are requested to suggest such alterations as will render it more suitable for the purpose in view.

as it is intended to issue both these pamphlets for the benefit of the people in the state

Yours truly

over.

SUBJECT.

2/3

3 Nov 1915 3/3.

General and Revenue Secretariat,

Bangalore, 3rd March, 1915.

Gen.-file

D. O.

No: 6801
Sanity

My dear Sir,

I am desired to forward herewith proof copies of an elementary manual of hygiene and a manual of - hygiene prepared by the Deputy Sanitary Commissioner Mr. Srinivasa Rao and request you to be so good as to favour Government early with your suggestions regarding any additions, omissions or alterations which you consider necessary in order to improve its usefulness as it is intended to publish these pamphlets for the benefit of the people in the State.

Yours truly,

D. M. Narasinga Rao.

To

Lt.-Col: T. H. Foulkes, I.M.S.,

Durbar Physician & Surgeon.

26

D. TV No. 6/13 mid 8/13 D 5579

Lacy 139-14-3

Dear Sir Narainga Row

I am very sorry but I have to leave immediately and cannot go through this in any way that would be useful

Yours sincerely

T M Bowles

Mysore
5-3-15

Cover 2

7599
Sanit 139-14-4 (Q) 30.3.15

Dear Sir,

I am desired to forward herewith for your information and favour of (reminder) your suggestions & remarks a proof copy of each of the two pamphlets on hygiene prepared by Dr. M. Srinivasa Rau, and approved by the D.G. of Edn and Dr. P. S. Achyuta Rau, ~~assembly~~ in connection with the development & Organisation subject No 3 for Aug 14 to Dec 14. I may add to request the return of the proofs with your suggestions kindly

Hon
30/3.

Rao Bahadur
T. V. Arumugam Mudaliar Esq. M.L.C. M.
Sanitary Commr in Mysore

28

D. O. No. IV Water book D 6386
Sanry 139-14-5

Office of the Sanitary Commissioner
with the Government of Mysore,

Camp Mysore
Bangalore, 12th April 1915
14

Dear Sir,

In reply to your D. O. No: 7599/Sanry. Dated the 30th ultimo, I beg to say that the pamphlets appear to me to be written in the style of formal essays and to presuppose an elementary knowledge of Anatomy, Physiology, Physics and Chemistry. The factor which I consider essential and which I would particularly take

take into account in judging of the possible usefulness of such publications is whether or not the writer has thoroughly identified himself with the class of readers for whom the publications are intended. Among the publications I know of, the little book herewith submitted satisfies this condition to a remarkable degree. As is evident from its title & table of contents it is preeminently suited not only for use as a text book in High schools but also for general readers whose literacy in English

is of the average standard.

The enclosures received are herewith returned

Yours sincerely

J. V. Thumuganu

To

A. V. Ramanathan Esq^rs B.A.
Assistant Secretary to
Government
General & Revenue Dept.
Bangalore

G. R. S. 26]

31

SUBJECT Publication of Dr. M. Srinivasa Rao's pamphlets on Hygiene

Diary No. of letter replied to

General and Revenue Secretariat

( )

, *the* 191 .

Date of issue 9.7.15

Signed by Mr. B. Sitlea Rao

Section Sanity.

File No. 139-14

Serial No. 6

No. 135

Sanity

8/9.7.15

To

The Inspector-General

of Education

Sir,

I am directed to refer you to your letter No. 877 dated the 21st January 1915 expressing your views as regards the usefulness of the two pamphlets, drafted by Dr. M. Srinivasa Rao on Hygiene, to the pupils in

over.

8/7/15

62

the High School and College classes, and to state that Govt. consider that the books may be printed on the authority of the author as a departmental publication and sold at a nominal price.

2. I am accordingly to request that necessary steps for its publication may be taken in consultation with Dr. Srinivasa Rao at an early date.

3. I am also to suggest that the books may be ~~[illegible]~~ printed at the Govt. Press, where the whole matter is now standing in type, and the sale proceeds credited to Govt. in due course.

List of enclosures.

Copied by

Examined by

G.P.B.—20,000—14-2-14

I have &c

7.7.15

136
Sanit

9.9.7.15

Copy to Dr. Srinivasa R.

for info in B.6

Dft. Secy